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Targeting Ambulatory Care Cases for Risk Management and Quality Management

Means are needed to identify "highly productive" areas for quality review and risk management in ambulatory care; untargeted medical record reviews have too low a yield and too high a cost to be useful. Highly productive areas are those with important medical and economic consequences, large numbers of cases, and a reasonable potential that problems exist. This paper describes untoward event screens to identify highly productive areas for review based on hospital discharge diagnosis, procedure codes, and parameters such as length of stay and cancer staging. The approach proposed has been evaluated in six ambulatory care organizations and appears effective and efficient.

To evaluate and influence quality of care, and to identify cases where a poor outcome may require action to ameliorate negative clinical, legal, or financial consequences, health care delivery systems must identify bad outcomes—untoward events, under- and overutilization, and poor proficiency. Given the time and costs, and the low yield of cases with quality concerns that derive from clinical/medical record reviews (Thomas and Longo 1990), there is a need to identify "highly productive" areas for review, as well as to develop approaches to case identification in these highly productive areas (Hannan et al. 1989). Highly productive areas are those having important patient consequences, such as the "sentinel events" originally described by Rutstein et al. (1976), large numbers of cases, and a reasonable potential that problems exist (Benson and Townes 1990).

Approaches to Targeting Cases

A number of approaches to targeting highly productive cases for hospital quality assessment have been or currently are being examined. In particular, there are occurrence screening approaches that employ diagnosis related groups (DRGs) and *The International Classification of Diseases*, 9th revision, (ICD-9) codes, along with selected case characteristics. These approaches include the Health Care Financing Administration's (HCFA's) sampling criteria (HCFA 1988), disease staging (Aronow 1988), and severity and acuity indexes (Thomas and Longo 1990). Such systems allow hospital quality monitoring units to identify cases that differ from normative expectations in terms of length of stay, use of procedures, and outcomes. The applications of these approaches have focused on areas primarily relevant to the quality of care within the hospital setting, the exception being the potential for using disease staging to evaluate admission appropriateness (Gonnella, Louis, and McCord 1976; Aronow 1988).

Are hospital "occurrence" reports useful to ambulatory care organizations? Certainly an ambulatory care program should obtain, and would find

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useful, any data collected by hospitals that involve the ambulatory care organization's physician or patient. These provide, however, a narrow characterization of the types of cases meriting review, whether for risk management or quality improvement. Most hospital criteria relate to success of procedures or cases treated, and do not address the reason for the procedure, or the possibility that the level of difficulty of the case might represent inadequate prior care, such as a delay in diagnosis, a missed diagnosis, or a lack of preventive or well care.

As examples, a hospital occurrence screen might identify an infection or death after breast surgery, but as long as the surgery went well it usually would not identify a case that involved a delay in diagnosis until the cancer had advanced to stage II or III. An admission for resetting a nonaligned or misaligned fracture might be identified for hospital quality assurance and risk management purposes if there were a death, infection, drug reaction, or loss of function due to the treatment, but the case would not otherwise be targeted for review. For an ambulatory care organization, a nonaligned or misaligned fracture alone is a prime concern for risk management and quality assurance activities.

In contrast to approaches targeting highly productive cases in hospital quality assurance, methods specifically developed to evaluate ambulatory care often have been limited to detailed review of specific tasks within ambulatory care (e.g., routine well-child height and weight checks, or blood glucose monitoring). Earlier efforts in ambulatory care entailed significant time and resources for implementation (Palmer et al. 1984; Palmer 1988). More recent programs utilize claims data but still tend to focus primarily on utilization concerns (Leatherman et al. 1991). While these programs provide an important contribution to assessment of quality in ambulatory care, particularly in regard to preventive or chronic disease care, they do not serve to target a broad range of areas for quality assurance and risk management, and they can be costly to implement. An exception to the detailed record review or utilization review is the approach taken in the Minnesota Project (Solberg et al. 1990). More will be said about this project later.

Ambulatory care systems face a far more difficult problem than hospitals in identifying highly productive areas for quality assurance and risk management, and in finding approaches to targeting cases for evaluation (Gonnella and Louis 1988). This is because: 1) in ambulatory care there are far more encounters, and it is more difficult to define distinct episodes than in hospital care; 2) labeling of symptoms or diagnoses varies more and is less precise for ambulatory care patients than for hospitalized patients; 3) negative outcomes from ambulatory care generally do not take place while the patient is in the institution and may not be recorded; and 4) most ambulatory care data systems are not highly developed.

Nearly all hospitals now have computerized files of DRGs and/or ICD codes—with multiple diagnoses—and attention is paid to the quality of diagnosis coding and entry. With these a hospital can readily use a series of screens to scan hundreds of discharges and identify small groups of cases that merit individual review. If an ambulatory care organization employed a computerized coding system for complaints, diagnoses, and outcomes, then a targeting system parallel to that used by hospitals could be employed to identify key untoward outcomes of ambulatory care, such as missed diagnoses, delayed diagnoses, drug reactions or interactions, ineffective procedures, or underuse of defined services for at-risk patients. However, coding systems of symptoms/complaints, diagnoses, or outcomes seldom are employed, and few ambulatory care organizations have computerized files of data about ambulatory encounters.

Development of Untoward Event Identification Screens

An approach was developed to identify homogeneous groups of untoward outcomes of medical care that were ambulatory care/primary care oriented. This was done as part of a research effort to examine the doctor-patient and system-patient relationships as predictors of malpractice cases when a negative outcome has occurred in ambulatory care organizations. A method to identify cases based on the usual data systems of ambulatory care organizations could not be found for the reasons noted earlier, and the cost of medical record reviews to identify cases was prohibitive. However, since most large group practices or health maintenance organizations (HMOs) have computerized files of hospitalized cases (with diagnosis and procedure codes, as well as length of stay) as part of their payment or billing and utilization review systems, it was decided to try and employ these systems to identify the types of ambulatory occurrences/events desired.

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The goal was to identify codes for diagnoses and procedures, and length of stay information, which would define homogeneous groups of important untoward events (UEs)—events that were important because of their potential consequences to the patient or their relationship to the ambulatory care organization's quality assurance and risk management goals. To qualify as a UE required meeting the following criteria: 1) the UE would have had to manifest itself in a hospital stay (an ambulatory surgery encounter also could be employed); 2) the UE could be defined using ICD-9 diagnosis and Current Procedural Terminology (CPT) codes individually, or in combination, and length of stay; and 3) the UE often would signal (though not necessarily mean) inadequate care.

This approach is similar to severity-of-illness methods which have focused on quality of care in hospitals (Iezzoni and Daley 1992; Thomas and Longo 1990; Aronow 1988), but it specifically targeted ambulatory care concerns. It also is similar to the staging methodology developed by Gonnella and Louis (1988), but allows direct identification of "high yield" cases without the intermediate step of using criteria to classify cases into specified stages. In addition to the three criteria mentioned, research purposes required that the UEs had to identify cases with similar consequences to the patient, and had to have a reasonable incidence. However, for operational purposes in an ambulatory care organization, homogeneity in consequences or the need for a large incidence would not be essential.

Medical directors of ambulatory care organizations, medical school specialists, and a few selected ambulatory care organization physicians identified "problem" areas for both risk management and quality assurance in ambulatory care. Malpractice literature was another source used to identify potential problem areas that have a primary care or ambulatory care component. A number of problems that might meet the criteria for a UE were suggested by the physicians and literature; some already have been noted—nonalignment/misalignment of a fracture and breast cancer first identified at stage II or beyond. Others of particular interest to ambulatory care organizations—because they might reflect delay in diagnosis or problems with treatment—included: complications of ectopic pregnancy and abortion; appendicitis with peritonitis; rectal cancer; and cervical cancer stage IB or greater. Two other UEs that may derive from either problems with prenatal care or from activities in the hospital were identified because of their frequency and consequences to the patient/family or their risk to the ambulatory care organization. These were baby birth injury and death, and postpartum complications. Several of the UEs listed earlier might be identified by a hospital reporting system. However, the focus of review in the hospital would not necessarily include the appropriateness of utilization and proficiency in the delivery of ambulatory care.

Six UEs were selected for the purposes of this study: appendicitis with peritonitis; rectal cancer; breast cancer stage II or greater; postpartum complications with greater than a three-day length of stay; birth injuries; and complications of abortion and ectopic pregnancy. The UEs included cases that would be handled by different types of physicians—pediatricians, internists, family physicians, and obstetricians. Further, these UE cases impact adults and children, males and females, and relate to well or preventive care, diagnosis, and treatment activities.

For each of the UE problem areas, medical consultants defined the ICD-9 diagnosis and CPT procedure codes, and sometimes length of stay, that would capture the cases desired. For the breast cancer cases, it was found that information on stage of cancer was needed to limit the cases identified to those whose disease was advanced enough to suggest a possibility of delay in diagnosis or in seeking care. Although use of cancer registry information involved using a type of staging, this is the existing staging method for cancer which is part of the usual diagnostic process. No criteria needed to be developed or applied. Thus, each UE problem was defined as those cases at the intersection of specified ICD-9 diagnosis codes and specified CPT procedure codes, as well as meeting selected cancer staging and length of stay minimums. The staging and length of stay criteria contribute measures of severity. An example of the parameters/criteria used in the research project for case selection is presented in Table 1.[1]

Methods

Six large ambulatory care organizations, all group or staff model HMOs with two being parts of large medical centers, were asked to develop computer programs applying the UE criteria to their hospitalization files from 1986 through 1990. A number of sites did not have adequate information systems or data to employ the UE identification screens prior to 1988. However, all sites now have the manage-

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Table 1. Appendicitis with peritonitis untoward event

Definition: Appendicitis with either generalized concurrent peritonitis or peritoneal abscess.

Identify all cases with either of the following hospital discharge diagnosis ICD-9 codes:

1. 540.0 Acute appendicitis with generalized peritonitis
2. 540.1 Acute appendicitis with peritoneal abscess

Which also have one of the following ICD-9 procedure codes:

A. 47.0 Appendectomy
B. 47.2 Drainage of appendiceal abscess
C. 47.9 Other operation on appendix

Include all cases with:

1 and (A or B or C), or
2 and (A or B or C)

ment information systems and data to identify cases. Management information systems personnel reported that development of programs to retrieve UE cases required an initial time investment ranging from a few hours to two days. However, once the programs were developed they were modified easily to examine different sets of criteria.

Access to tumor staging information proved to be more difficult. None of the study sites had cancer staging included in their data fields. The two sites that are part of large medical centers were able to access staging information from their hospital cancer registries. Two other sites were able to access cancer staging from several regional cancer registries. However, in the last two sites accessing staging data was a great administrative burden and, therefore, not pursued from registries. This led to the need to review for staging all cases identified through codes as breast cancer with mastectomy from these two sites. Although some sites did not have ready access to tumor staging for past cases, it would not be difficult for ambulatory care organizations to acquire and store this information for future use.

The predictive value of the UE screens or validity of the cases identified—that the cases did represent the type of UE case intended—was checked when, as part of the larger research project, registered nurses or medical record room staff abstracted the ambulatory care records of cases identified as meeting the UE screening criteria. These personnel were employees of the six study sites and were trained as abstracters in a two-day training session. Cases were classified as "not a UE" for a variety of reasons, most of which related to the criteria for the research study and not whether the patient had experienced the UE. Reasons for exclusion as a UE case included: presence of a previous severe medical condition (such as AIDS) which made outcomes differ from those of most cases; care provided out of the geographic area specified for the study; or lack of ambulatory care at the study site prior to hospital referral of the patient with the UE condition.

To assess utility of the screening criteria in identifying cases that warranted quality improvement and risk management attention, the medical records for two types of UE cases—appendicitis with peritonitis and birth injury—were reviewed for possibility of management causation of the UE and for possibility of negligence associated with the UE. Since management causation is a prerequisite for negligence, reviewers first were asked to evaluate cases for evidence that the injury (the UE) was related, in part, to the medical care the patient received or should have received. If evidence of management causation was found, the case also was evaluated for evidence of negligence—that the care given deviated from standard practice for a similar physician in a similar circumstance.

To accomplish the reviews for medical management causation and negligence, records were acquired for each appendicitis and birth injury case from the date that the first UE symptom was documented through the dates of hospitalization for the UE. The blind records for each appendicitis and birth injury case were reviewed independently by two board certified physicians—internists, family practitioners, and pediatricians for the appendicitis cases, and obstetricians for the birth injury cases. Physician reviewers were all in active practice in ambulatory care, and represented a variety of practice settings, from fee-for-service to closed panel HMOs to large academic medical centers in 11 different states.

Physicians who reviewed the cases completed a detailed Merit Assessment Form. The form asked them to rate the possibility of management causation of the UE (described as "medical management or lack of medical management caused the UE or caused an increase in the severity of the UE"), and the possibility that the UE resulted from negligence (defined as "deviation from standard practice for a similar physician in a similar circumstance"). The merit assessment form (see Table 2) was based on the Harvard Medical Practice Study Adverse Event Analysis Form (Brennan, Localio, and Laird 1989),

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Table 2. Contents of the Merit Assessment Form

I.	Classification of the extent of injury
II.	Determination of the cause of the untoward event
III.	Categorization of the strength of evidence that there was medical management causation
IV.	Initial evaluation of a possibility of negligence
V.	Classification of type(s) of error(s) in the case
VI.	Determination of mitigating or aggravating circumstances in determining the possibility of negligence
VII.	Determination of presence of negligence
VIII.	Categorization of seriousness of negligence
IX.	Categorization of the strength of evidence for negligence

Note: Adapted from the Harvard Medical Practice Study Adverse Event Analysis.

and was revised for this study. Physician reviewers were oriented and trained in use of the form with a selected practice case. Physicians used their own judgment regarding both medical management causation and negligence; no protocol was given. Therefore, judgments were based on implicit rather than explicit criteria. All UE cases received two independent physician reviews. If the two reviewers disagreed regarding the possibility that the UE resulted from negligence, the case was submitted for a third review.

In summary, both the validity and utility of the cases identified by the UE screens were assessed. Validity was checked as part of the process of medical record abstracting of cases, and utility was examined through independent reviews of blind cases by board certified physicians. The results that follow include the number of UEs identified for review, the validity of the UEs identified, the number of physicians whose cases were reviewed, and the utility of the UEs for quality improvement and risk management.

Results

Table 3 presents the number of cases identified for the six UEs, for periods of one to five years of exposure for six ambulatory care organizations. The screens for the six UEs produce a small number of cases for review per year, with an average of one-half case per 1,000 enrollee years for all sites and years. Five sites fell between .4 and .9 cases per 1,000 enrollee years. Site 3 (in Table 3), one of the two sites with .9 cases per 1,000 enrollee years, had some fee-for-service UE cases that were not accounted for in the denominator, therefore inflating somewhat the estimate of cases per 1,000 enrollee years for that site.

Analysis of 1,111 medical records abstracted for the research study indicate that 199 (18%) of the cases identified failed to meet some other criteria for the study, or did not actually have the UE as defined (see Table 4).[2] Reliability of abstracters' judgments as to whether cases were true UEs was found to be high, with 98% agreement on categorization between abstracters and the research investigator (Macnee), who is a nurse practitioner.

Eighty-eight (44%) of the 199 cases that were not UEs were breast cancer cases, and the bulk of these (n = 76) were from the two sites which could not access tumor staging before abstracting the case.

Table 3. Number of UEs identified for 1986 through 1990 for six ambulatory care organizations

	Site 1 (180,000)	Site 2 (75,000)	Site 3 (60,000)	Site 4 (150,000)	Site 5 (84,000)	Site 6 (150,000)
	1988–1989	1986–1990	1986–1989	1986–1990	1988	1988–1990
Exposure years	2	5	4	5	1	3
Untoward event (UE)						
Appendicitis	15	36	47	80	11	38
Rectal cancer	12	12	32	32	0	12
Breast cancer	25	50	81	111	5	135
Postpartum complications	0	10	0	17	9	20
Birth injury	26	41	57	73	50	40
Abortion/ectopic complications	12	7	0	15	0	0
Total UEs identified	90	156	217	328	75	245
UEs per 1,000 enrollee years	.25	.42	.90	.44	.90	.54

Note: Enrollments are in parentheses under site numbers.

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Table 4. Rate of error in identification of untoward events by UE type for combined cases across sites

	Cases identified	Not a UE	"True" UE	Error rate (%)
Appendicitis	227	26	201	11
Rectal cancer	100	8	92	8
Breast cancer				
Total	407	88	319	22
Prestaged	222	12	210	5
Postpartum complications	56	11	45	20
Birth injury	287	66	221	23
Abortion\ectopic pregnancy	34	0	34	0
Total	1,111	199	912	
with breast cancer prestaged	926	123	803	

These 76 cases were excluded because it was found that they were not stage II or greater, though they were breast cancer cases. Cancer staging data was obtained easily if organizations knew they were going to employ it; therefore, we estimate that the error rate for breast cancer would be about 5% for ongoing program use.

Another 66 cases found not to be UEs were birth injury cases. A third of these cases were from one study site (with an error rate of more than 80%). At the five other sites, the error rate for the birth injury UE averaged 13%. Two factors were probably at work here: first, the complexity of the screening criteria for this UE and, second, at the one study site with the high error rate there was obvious variability in one hospital's use of ICD-9 codes for obstetrical care.

The remaining 45 cases not included as UEs were distributed among the other four types of UE problem areas and reflected nonsystematic factors which primarily related to the research study criteria, such as cases where an earlier cancer had been diagnosed prior to the rectal cancer. In a few cases the UE problem was suspected, but eventually another diagnosis was established. In most instances, UE cases were excluded because they failed to meet study criteria established to promote homogeneity in outcomes, rather than due to an error in coding (the exception being the birth injury problem at the one site). An estimated overall error rate for the UE screens was less than 10%.

Because many organizations have an interest in profiling physicians for quality improvement, the number of different physicians who were identified as primary providers for the UE cases was examined. The primary physician provider to UE case ratio was 51 providers per 100 cases, with a range of 28 to 69 providers per 100 UE cases for the six sites. Approximately 35% (n = 129) of the physicians identified were found to be primary providers for more than one UE case. Thus, cases identified by the UE screens were not those of just a few physicians; however, neither were they such isolated instances that each represented the care of a different physician.

A total of 203 cases—123 appendicitis cases and 80 birth injury cases—have received full physician review for management causation and negligence. Data have been collected chronologically, and the UE cases that have received physician reviews are those from the earlier years covered in the study. All cases that had been abstracted, and for which medical records had been obtained by November 1992 were included.

There was agreement on the presence or absence of medical management causation by two physicians in 169 (83%) of the 203 cases, and physicians agreed on presence or absence of negligence (without a third review) in 182 (90%) of the 203 cases. This represents a high level of inter-rater agreement, given that judgments were based on implicit criteria. Because the focus here is on evaluating the UE screens for use in quality assurance and risk management, any case in which at least one physician reviewer found evidence of medical management causation is considered relevant and warranting review. Of the 123 cases identified by the appendicitis screening criteria, 43 (35%) were judged by at least one of the reviewing physicians as having at least "slight to modest evidence" for being caused by medical management (See Table 5).[3] Of the 80 birth injury cases, 20 (25%) were judged by at least one physician as having at least slight to modest evidence of medical management causation.

Twelve appendicitis cases (10%) and nine birth injury cases (11%) required a third physician review because of disagreement about the possibility of negligence in the first two reviews. Fifteen of the appendicitis cases (12% of the total cases reviewed), were rated by two physicians independently as having at least "slight to modest evidence" that the UE resulted from negligence (see Table 6). A total of 55 errors considered deviations from standard medical care were identified in the 15 cases (there were at least two reviewers per case

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Table 5. Ratings on medical management causation for appendicitis and birth injury cases

	Appendicitis (n = 123)		Birth injury (n = 80)	
	Number	%	Number	%
Cases reviewed as no causation by two reviewers	80	65	60	75
Cases reviewed as some causation by one reviewer	20	16	14	17
Cases reviewed as some causation by two reviewers	23	19	6	8

and each could identify more than one type of error). Errors were grouped into assessment, process of care, performance of a procedure, drug treatment, system errors, or other errors. Not surprisingly, the most common type of error identified in appendicitis cases was an error in assessment—"failure to order or perform appropriate screening or diagnostic procedures or tests" (46% of errors). The second most common type of error identified was in the process of caring for the UE—"failure to employ accepted standards of management" (33%).

In contrast to the appendicitis cases, only two birth injury cases (3% of UE cases reviewed) were rated by two physicians as having at least slight to modest evidence that the UE resulted from negligence (See Table 7). A total of 10 deviations from standard medical care was identified in these two cases. Three were errors of assessment—"failure to order or perform appropriate screening or diagnostic procedures or tests." Three errors were in process of care—"failure to employ accepted standards of management." One error was in the "performance of a procedure or operation," and three errors were "primarily caused by the medical care system, such as equipment, communication problems, or staffing."

Discussion

The screening criteria that were developed, using codes for diagnoses and procedures, cancer staging, and length of stay information, appear to identify accurately cases which have important implications for quality assurance and risk management. Given the nature of this study, it is not possible to assess "false negative" errors where "true" UE cases were not identified by the screens. "True" cases could be missed for two reasons: poor coding of cases in hospitals, and inadequate information systems at the study sites. If anything, the kinds of errors found suggest that problems with reliability in use of ICD-9 and CPT codes probably reflect errors of commission in the direction of "overcoding" rather than failing to code cases, and many of these errors were from one site. This would lead to a problem of "false positives" rather than "false negatives." As indicated earlier, false positives were excluded based on information from abstract

Table 7. Birth injury case ratings on medical management causation and negligence

	Site 1	Site 2	Site 3	Site 4	Site 5	Totals
Number of cases reviewed	2	2	32	37	7	80
Number of cases with possible medical management causation	1	0	5	13	1	20 (25%)
Number of cases requiring 3 reviews	0	0	3	5	1	9 (11%)
Number of cases with possible negligence	0	0	0	1	1	2 (3%)

Table 6. Appendicitis case ratings on medical management causation and negligence

	Site 1	Site 2	Site 3	Site 4	Site 5	Totals
Number of cases reviewed	7	9	44	51	12	123
Number of cases with possible medical management causation	4	2	16	18	3	43 (35%)
Number of cases requiring three reviews	1	1	6	4	0	12 (10%)
Number of cases with possible negligence	1	1	6	7	0	15 (12%)

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ing of the medical records and they occurred primarily at one site. Also, given the HMOs' responsibility in paying for care, it seems unlikely that cases would not be in their files.

If "true" cases were missed, it probably occurred because of problems in databases and data retrieval systems in the respective organizations. In fact, the number of UE cases identified at one site (Site 1 in Table 3) was suspiciously low. At the time of data collection, this site was employing a new data system which was proving to have some problems. A recent rerun of the data has yielded additional cases for the same period with a UE incidence rate much closer to that of the other five sites. Our general impression, based in part on evaluations of the additional cases from Site 1, is that any missing "true cases" are typical cases, and would have a similar rate of causation and negligence as that found for the cases reviewed.

The relatively low error rate found in this study suggests efficient targeting of UE cases based on the criteria. It is clear that criteria for some of the UEs, such as rectal cancer, which had only an 8% error rate, are tighter, more narrowly defined, and yield a more homogeneous group of cases than others. The strength of these more narrowly defined criteria have to be weighed against the usefulness of the data from the broader, and perhaps looser criteria developed. Despite the higher error rate and lower yield for negligence, cases such as those identified by the birth injury criteria are associated with enough risk to support use of broader criteria.

Interestingly, as the authors were exploring the use of ICD-9 diagnosis and CPT procedure codes to target cases for their study, a similar approach was being explored by three HMOs and the Department of Health in Minnesota (Solberg et al. 1990). This group also had recognized the need to develop approaches that produced ambulatory cases with a high probability of reflecting inadequate prehospital care. They identified 15 "indicator conditions" which met these criteria: 1) were clearly defined using ICD-9 codes, 2) had an admission rate of at least one per 10,000 enrollee years, 3) covered a broad range of patient demographic characteristics and care types, and 4) had a perceived likelihood that the indicator admission either should have occurred earlier or could have been avoided. The report of the Minnesota project does not indicate use of any additional qualifiers, such as length of stay or cancer staging, to further refine UE screens.

Four of the UEs overlap or are identical with the indicator conditions examined in the Minnesota project; both studies identified breast cancer, appendicitis, ectopic pregnancy, and premature birth as potential highly productive areas for quality improvement in ambulatory care. Several of the indicator conditions in the Minnesota project were conditions, such as diabetes mellitus and hypertension, where patient compliance played a critical role in clinical outcomes. This type of condition had been excluded from the current study in order to focus on UEs where the outcome was most likely to reflect a problem that could be addressed directly within the ambulatory care organization. This is not to say that UEs related to patient compliance are not important for quality assurance, or that the ambulatory care organization does not have responsibility to influence compliance.

The frequency with which the identified cases actually did not experience the indicator condition—parallel to our validity—is not presented in the Minnesota report. However, in regard to utility, the Minnesota project found that 22% of the 673 cases identified using the indicator conditions as screens were cases "representing probable quality of care concerns" (Solberg et al. 1990, p. 359). Quality of care concerns as described in the Minnesota project were meant to be cases "that should be reviewed by a physician" (Solberg et al. 1990, p. 362) and probably were most similar to cases in our study where evidence of medical management causation was found. Their rate was slightly lower (22%) than that found in our study (31%). This may be accounted for by the differences between the UEs and indicator conditions, and the more extensive and complex criteria for the birth injury UE (including 12 ICD-9 diagnostic codes) in this study, compared to the Minnesota project's single birth-related indicator condition of premature birth. The Minnesota project did not report on possible negligence in the cases with the indicator conditions.

The successful application of the two independent efforts to develop screens using hospital codes to target ambulatory care cases for quality assurance and risk management supports the potential usefulness of this approach. The Minnesota project report did not comment on the potential usefulness of its approach for risk management in ambulatory care; in our study, identification of UEs was planned specifically with the interests of both risk management and quality assurance in mind.

Estimates of the rates for management causation and negligence for typical births or all cases of

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appendicitis are not available; therefore it is difficult to evaluate the yield or "productivity" of the UE screens. Donn et al. (1989) reviewed 115 birth cases being prepared for litigation and found that medical management causation contributed to negative birth outcomes in 45% of the cases, and that in 30% of the cases there was some question of negligence. These rates of causation and negligence are higher than those found in our study, but that is not surprising considering the source of Donn et al.'s (1989) study sample.

Jess et al. (1981) examined the records of all patients who underwent an operation for acute appendicitis over a six-month period at one site, and found that 16% of acute appendicitis cases had a perforated appendix, suggesting a delay in diagnosis. The UE screen described in this study specifically targeted appendicitis cases with peritonitis or abscess, and therefore the yield of 35% with management causation, and 12% with deviation from standard of practice, is probably compatible with the findings of Jess et al. It is only possible to speculate regarding rates of causation and negligence for the other UEs included in our study, because the funding constraints precluded physician reviews for all the UEs.

Obviously, both an ambulatory care organization's clinical population and its quality of care are determinants of the number of UE cases identified for a specific type of UE. As desired for the research study, use of the UE screens described earlier produced a manageable number of cases. The specification of parameters for identification of a UE case (in terms of codes and days, etc.) could be relaxed or modified, so the number of incidents for review would increase. For example, rather than limiting postpartum complications to only those that led to an extension in length of hospitalization, one might want to include any complications which required procedures not normally part of routine postnatal care. The procedures included would be dictated by the particular goals and protocols of physicians and risk managers within the ambulatory care organization.

In addition, there are ambulatory care problems that occur relatively infrequently, but which warrant identification and review whenever they occur. Two medical diagnoses for which hospitalization would be expected, and which are vulnerable areas in primary/ambulatory care, are torsion of the testicle and bacterial meningitis. These conditions, in their early stages, can be treated very effectively, but require a high index of suspicion on the part of the providers to assure early detection. Therefore, ambulatory care organizations might want to include UE screens for these conditions, assuring recognition of problems needing immediate action to ameliorate any negative clinical and legal/financial consequences, assuring feedback to keep practitioners alert, and assuring concurrent review of the quality of care provided. Although, for the purposes of the research, cases were identified retrospectively for one to five years, cases could be identified concurrently (on discharge or even, as one site suggested, during the admission authorization process). Use of the screens likely would be a dynamic process, with different types of cases targeted depending on the particular protocols or needs identified.

In this research, physicians were employed for the reviews to establish the utility of the UE screens, the yield in terms of management causation and negligence. The UE screens are a method for limiting the number of cases requiring physician review for quality improvement, and therefore increase the feasibility of employing physicians for this purpose. However, physician review would not be essential for all purposes. For certain risk management purposes, reviews of the identified cases by nurses or risk management staff using explicit criteria may be adequate. Further, for certain quality assurance activities, an initial review by staff may be useful in further limiting the cases for physician review or discussion.

There has been a focus in this paper on yield, on the number of cases with medical causality and deviation from the standard of care. However, this should not be taken to suggest that the primary objective is searching for providers who are "bad apples." Identification of problematic cases is useful in risk management and in quality improvement activities such as standard setting and continuing education. Even where case reviews yield differences between reviewers, the information is useful for collaborative quality improvement processes because discussion of such cases can be valuable in both defining standards and reducing variation. Such discussions would reflect an interest in improvement, not solely in placing blame.

Summary

Identification of highly productive areas, in terms of patient outcomes and an organization's risk and quality of care concerns, which are manifested

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through a hospitalization with a selected combination of diagnoses and procedures, seems useful as a low-cost, focused methodology for ambulatory care organizations. This is not to suggest that the approach described here is sufficient, that use of UE screens is all that an organization should undertake for risk management and quality assurance. However, even when there are better coding systems for problems seen and treated in ambulatory care, and better systems for recording and computerizing data, the approach suggested in this paper may be one of the most effective, low-cost methods of identifying critical occurrences/incidents in ambulatory care.

Notes

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1 The screening criteria for the other UEs are available from the authors.
2 Given the small number of cases per UE type at each site, the cases have been combined across sites and/or across UE type to provide more stability in the estimates presented.
3 Because of difficulty accessing hospital records at one site, physician reviews for management causation and negligence have been completed at only five of the six sites.

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